

COMMENTS ON SOUTHWESTERN UNITED STATES  
*EVOLVULUS* AND *IPOMOEA* (CONVOLVULACEAE)

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ABSTRACT

*Evolvulus alsinoides* and *E. arizonicus* have historically been difficult to distinguish. Most specimens of these two taxa may be identified by corolla size; all specimens in this region by sepal size. Typification of *E. arizonicus* is discussed, and a lectotype chosen. The name *Ipomoea hirsutula* has been a mixed concept applied to two species in publications for a number of years. Proper names of these species (*Ipomoea hederacea* and *I. purpurea*), their traits, and ways of distinguishing them are discussed.

RESÚMEN

*Evolvulus alsinoides* y *E. arizonicus* históricamente han sido difíciles de separar. La mayoría de las muestras de herbario de estas dos especies pueden distinguirse por el tamaño de la corola. Todas las muestras del sudoeste de los Estados Unidos pueden distinguirse por el tamaño de los sépalos. Tipificación de *E. arizonicus* se discute, y se selecciona un lectotipo. El nombre *Ipomoea hirsutula* ha sido un concepto mixto que fué aplicado a dos especies en las publicaciones en el pasado. Los nombres correctos para estas dos especies son *Ipomoea hederacea* y *I. purpurea*. Se presentan sus características y los modos de distinguirlas.

EVOLVULUS L.

*Evolvulus* has within it a complex of species allied with *E. alsinoides* that remains confusing to all who have studied them recently (Ooststroom 1934; Kearney and Peebles 1942; Kearney et al. 1951, 1960; Shreve and Wiggins 1964; Martin and Hutchins 1981). The only revision of the complex was made by Ooststroom (1934). In this revision, based entirely on herbarium material, Ooststroom recognized many varieties of several species. Most of the varieties are, in my opinion, manifestations of phenotypic plasticity and are unworthy of formal taxonomic rank. Still, there is need for study of the *E. alsinoides* complex to determine the source of the variation.

Two characters have been used to distinguish *E. alsinoides* from *E. arizonicus*—corolla size and pubescence type. According to Ooststroom (1934), *E. alsinoides* has corollas 5.5–7 mm wide, and *E. arizonicus* has corollas up to 16 mm wide (no minimum was given). Pubescence of *E. alsinoides* is characterized by appressed and spreading trichomes on the stems (Ooststroom 1934). *Evolvulus arizonicus* var. *arizonicus* has only spreading trichomes, although *E. arizonicus* var. *laetus* has appressed and spreading trichomes like

TABLE 1. COMPARISON OF COROLLA SIZES IN LIVING AND HERBARIUM SPECIMENS OF *EVOLVULUS ALSINOIDES* AND *E. ARIZONICUS*.

| <i>E. alsinoides</i>            | <i>E. arizonicus</i> |
|---------------------------------|----------------------|
| Corollas of herbarium specimens |                      |
| Number = 25                     | Number = 89          |
| Range = 5–10 mm                 | Range = 10–19 mm     |
| Mean = 7.1 mm                   | Mean = 12.89 mm      |
| Mode = 7 mm                     | Mode = 12 mm         |
| Corollas of living specimens    |                      |
| Number = 133                    | Number = 138         |
| Range = 6–10 mm                 | Range = 12–20 mm     |
| Mean = 8.26 mm                  | Mean = 17.28 mm      |
| Mode = 8 mm                     | Mode = 19 mm         |

*E. alsinoides*. Subsequent authors have varied in their interpretations of the corolla sizes and, to some extent, pubescence (Wooten and Standley 1915; Tidestrom and Kittell 1941; Kearney and Peebles 1942, 1951, 1960; Shreve and Wiggins 1964; Martin and Hutchins 1981).

Since the delimitation of the two species has been based largely on corolla sizes in the past, measurements were made of specimens with corollas in ARIZ. I also studied the pubescence on these specimens. Later I used the 1989 fall flowering period in Arizona to make corolla measurements and examine pubescence on living specimens from several parts of the range.

In the ARIZ sample, there is a continuous range of corolla sizes from 5 to 19 mm wide (Table 1). Field measurements, however, show that living corollas of *E. alsinoides* range from 6–10 mm wide, and those of *E. arizonicus* range from 12–20 mm wide. Thus, the two species may normally be separated by corolla size at least on living specimens. The task becomes more difficult, and at times impossible, on herbarium material. Apparently the difficulty results from two components.

The most important component of overlap in the two species is found where they occur sympatrically or parapatrically. In the samples made during 1989 there was complete geographic separation except in one site. At this locality (Redington Pass, Pima Co., AZ) the two species were sympatric and intermixed, and a few plants showed intermediate corolla sizes.

A second component of potential misidentification is corolla shrinkage. In living specimens studied in 1989, the corollas shrunk by as much as 2–3 mm as they wilted. When the corollas of *E. arizonicus* are on the small end of the size range, such shrinkage would bring them down into the *E. alsinoides* range. Failure to press the specimens immediately also allows them to wilt and shrink.

All of the specimens examined in ARIZ had appressed pubescence in the large-flowered forms, but some spreading trichomes on plants with the smaller end of the corolla size range. I observed the same situation in living plants.

Both the intermediate flower sizes and the sharing, on some specimens, of pubescence traits may indicate a hybrid origin. Specimens with intermediate flower sizes and pubescence are those previously separated as *E. arizonicus* var. *laetus*. In the field and the herbarium these specimens have more traits of *E. arizonicus* than *E. alsinoides*. For this reason, I continue to include them within that species.

Because corolla size and pubescence are unreliable characters for determination of intermediate specimens, another trait is needed. I found that sepal length measurements work well. Ooststroom (1934) listed this trait, but did not indicate that it might be used to separate taxa. The following key summarizes the distinctions between the species.

- a. Flowering sepals 2–2.5 mm long; corolla (5–)7–10 mm wide; stems with appressed and long spreading trichomes. . . . . *E. alsinoides*  
 a' Flowering sepals 3–3.5 mm long; corolla (10–)12–22 mm wide; stems with appressed trichomes, rarely with spreading trichomes. . . . . *E. arizonicus*

#### NOMENCLATURAL SUMMARY

1. EVOLVULUS ALSINOIDES L. var. ANGUSTIFOLIA Torrey, Bot. Mex. Bound. 150. 1858. TYPE: Texas. Brewster Co. Near the Grand Canyon of the Rio Grande. August. *Parry s.n.* (GH, not found; US, not found; NY, not found).  
*E. acapulcensis* Willd. ex Roemer & Schultes, Syst. Veg. 6:199. 1820; *E. alsinoides* var. *acapulcensis* (Willd.) Ooststr., Meded. Bot. Mus. Herb. Rijks Univ. Utrecht 14:34. 1934. Type: Mexico. Guerrero. near Acapulco. herb. *Willdenow 6128* (B, not seen). Interpretation based on annotations by Ooststroom who saw the type.

Shinners (1970) was apparently the first to point out that this was the correct name for the plants in the Trans-Pecos area of Texas. The same variant occurs sparingly in New Mexico and occasionally in Arizona.

*Representative specimens.* USA. Arizona: Cochise Co.: Huachuca Mts., Ramsey Canyon, *Toolin 971 and Yatskievych 80-377* (ARIZ); Pima Co.: Rincon Mts., Manning Trail, *Blumer 3326* (ARIZ); Pinal Co.: upper Oak Springs Canyon, *Anderson and Warren 210* (ARIZ); Santa Cruz Co.: Sycamore Canyon, Goodding Research Area, *Kaiser 764* (ARIZ). New Mexico: Dona Ana Co.: S end Organ Mts., Long Canyon, *Todsén 700802-3* (NMC). Texas: Terrell Co.: Sanderson,



*Crockatt 16; 77* (both NMC). Mexico. Chihuahua: N Ciudad Chihuahua, *Ward and Worthington 81-369* (NMC).

2. *EVOLVULUS ARIZONICUS* A. Gray, *Syn. Fl. N. Amer.* 2, 1:218. 1886.—TYPE: See discussion below. Ooststroom (1934, p. 74), selected the following collection as lectotype: (Mexico. Sonora, sandy plains near the U.S. (the label says Mexican) boundary, 30 Aug 1884, *C. G. Pringle s.n.*). He did not cite an herbarium; I have seen specimens of this collection in BR, K, P, U and US. Ooststroom did not cite a single specimen of this species from GH, and presumably saw none of the GH material of this species.

There are eight collections in GH that bear annotations in Gray's own hand, and four of these bear the printed label for "Syn. Fl. N. Amer." The Pringle collection cited by Ooststroom is not in GH, although it does exist at US, without Gray's annotation. There is no evidence that Gray saw the specimens in BR, K, P, or U since he did not annotate them nor did he cite the collection. Because there is no evidence that Ooststroom saw any of the original material used by Gray, I consider his action that of neotypification (Greuter et al. 1988, Art. 7.9). Because the specimen cited by Ooststroom seems to be a neotype selected when original type material was available, a superceding lectotype still must be chosen.

I select here the following specimen as lectotype: Mexico: Sonora: Sandy prairies, flws blue, Sep 1857, *G. Thurber 1023* (specimen in GH!, annotated by Gray and bearing his "Syn. Fl. N. Amer." label). A second sheet, bearing three collections, was also annotated and labeled by Gray: Arizona: S. Pedro R., Jun, *E. K. Smith s.n.* (GH!, fl); Arizona, without location, 1873, *Dr. Loud 151-a* [spelling?] (GH!, fl and fr); Arizona: Camp Grant, 4753 feet, Jul 1874, *Dr. Rothrock 376* (GH!, buds).

- E. arizonicus* A. Gray var. *laetus* (A. Gray) Ooststr., *Meded. Bot. Mus. Herb. Rijks Univ. Utrecht* 14:76. 1934.—*E. laetus* A. Gray, *Proc. Amer. Acad. Arts* 17:228. 1882.—TYPE: Arizona, mesas and foot-hills of the Santa Rita Mountains. 6 May 1881. *C. G. Pringle* (holotype GH!; isotypes, F!, US!).

*Representative specimens.* USA. Arizona: Cochise Co.: Dragoon Mts., S jct Triangle T road with I-10, *Reeder and Reeder 7897* (ARIZ); Gila Co.: Mazatzal Mts., Collom Camp, *Collom 6973* (ARIZ); Graham Co.: Pinaleno Mts., Jesus Canyon, *Shreve 5278* (ARIZ); Greenlee Co.: 2 mi N Clifton, *Maguire et al. 11818* (ARIZ); Pima Co.: near jct FSR505 and FSR485, *McLaughlin 3416* (ARIZ); Pinal Co.: Oracle, *Thornber s.n.* (ARIZ); Santa Cruz Co.: Sta. Rita

Mts., Sta. Rita Research Reserve, *Haskell s.n.* (ARIZ); Yavapai Co.: upper Weaver Creek, *Butterwick and Hillyard 6878* (ARIZ, ASU); Unknown County: w/o locality, *Griffiths 1960* (ARIZ). New Mexico: Dona Ana Co.: Organ Mts., Parker's Well, 19 Jul 1901, *Wooton s.n.* (NMC); Hidalgo Co.: SW corner of the county, Guadalupe Canon, vic. of Hadley Ranch, *Spellenberg and Repass 5387* (NMC).

### IPOMOEA L.

Since *Ipomoea hirsutula* Jacq. f. (1811) was published, most people who have used the name, either in synonymy or as an accepted name, have misapplied it (e.g., Wooton and Standley 1915; Tidestrom and Kittell 1941; Kearney and Peebles 1942; Kearney et al. 1951, 1960; Shreve and Wiggins 1964; Lehr 1978; Martin and Hutchins 1981). I have not attempted to determine exactly when this trend began in the southwestern United States, but it has been going on since near the turn of the century. The name was not used by Gray (1886), but it was used by House (1908) and by Wooton and Standley (1915). Examination of the keys published and the determinations on specimens used by previous authors indicates that they had a confused concept of the species. Indeed, previous authors included two species in their concept of *I. hirsutula* (*I. hederacea* and *I. purpurea*), and similar confusion of the species they misidentified dates back to Linnaeus. Confusion has persisted even though the problem has been repeatedly summarized (Verdcourt 1957, 1958; O'Donnell 1959; Shinnars 1965; Austin 1986). The name *I. hirsutula* Jacq. f. should not be used as the correct name for any plant since it is a synonym of *I. purpurea* (L.) Roth (Austin 1986).

The source of confusion concerning these plants arose from the use of a variable leaf character. Historically "*I. hirsutula*" has been separated from "*I. purpurea*" by whether or not the leaves were lobed or entire (Wooton and Standley 1915; Tidestrom and Kittell 1941; Kearney and Peebles 1942; Kearney et al. 1951, 1960; Shreve and Wiggins 1964; Martin and Hutchins 1981). Thus, the name "*I. purpurea*" came to be applied to entire-leaved specimens of *I. hederacea* and *I. purpurea*, and "*I. hirsutula*" was applied to lobed-leaved specimens of the same two species. This trait will not separate species since a single plant of either species may have entire and lobed leaves.

The following key, figure, review of nomenclature, and list of species and specimens indicates the proper placement in the southwestern United States. Even though *I. nil* has not been found in Arizona, the key also includes that species since it is similar to and easily confused with *I. hederacea*. *Ipomoea nil* occurs near the southwestern United States in the geographically adjacent and environmentally similar regions of Baja California, Sonora and Chihuahua

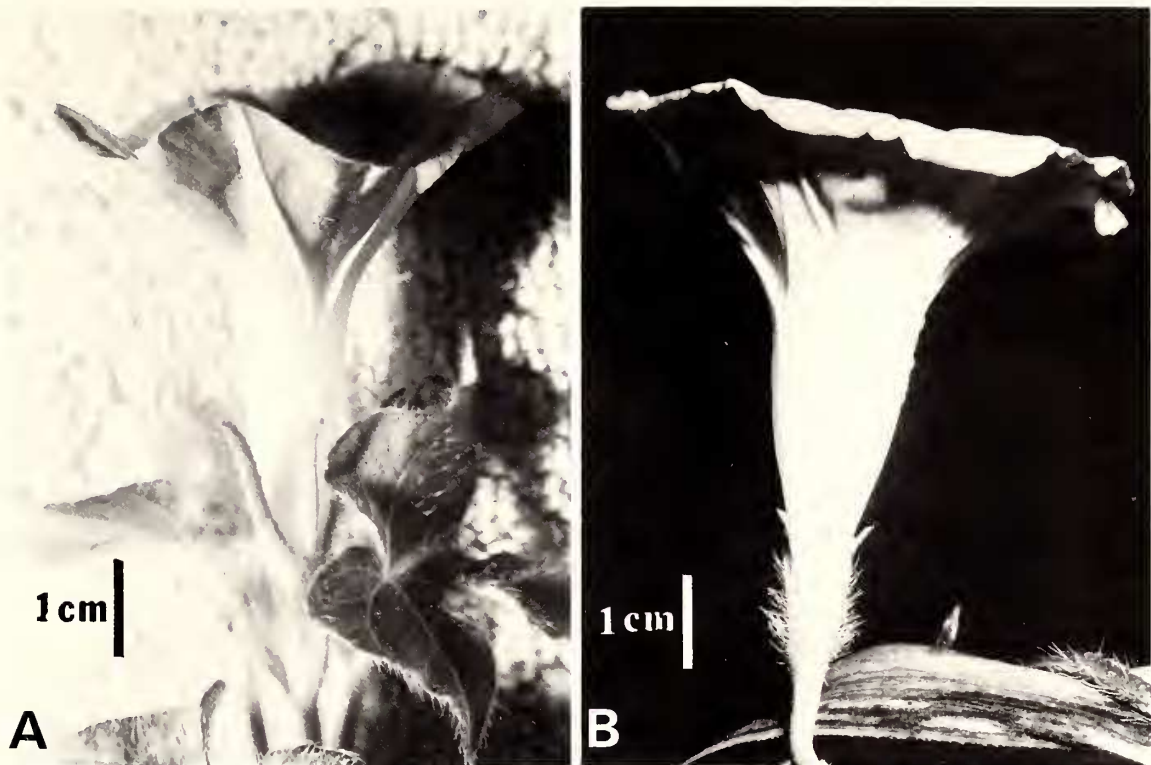


FIG. 1. A. Corolla and calyx of *Ipomoea hederacea*. B. Corolla and calyx of *I. purpurea*.

and extends south in Mexico into Jalisco, Hidalgo, Guerrero, and Oaxaca. The species is often cultivated, and may escape as it has in Texas, Louisiana, and Florida.

- a. Apices of sepals abruptly narrowing, shorter to slightly longer than body; sepals in flowering specimens 10–15 mm long; corollas 5–6 cm long (Fig. 1-B). . . . .  
 . . . . . *I. purpurea*
- a' Apices of sepals gradually narrowing, much longer than body; sepals in flowering specimens 12–35 mm long; corollas 2.5–8 cm long.
- b. Sepals 22–35 mm long, gradually narrowed, the long acute apices suberect, straight, scarcely spreading; corollas 5–8 cm long. . . . .  
 . . . . . *I. nil* (not known at present in AZ or NM, but in TX)
- b' Sepals 12–24 mm long, abruptly narrowed, the long, subacute apices strongly spreading or curved; corollas 2.5–5 cm long (Fig. 1-A). . . . . *I. hederacea*

#### NOMENCLATURAL SUMMARY AND NOTES ON TAXA

1. IPOMOEA HEDERACEA Jacq., Collect. 1:124. t. 36. 1787.—Type: Based on Dillenius, Hort. Elth. t. 80, fig. 92 (plate selected lectotype! by Verdcourt, 1957, 1958).

*Ipomoea hirsutula* sensu authors, pro parte, non Jacq. f. (1811).  
 For additional synonyms see Austin (1986).

The sepals on herbarium specimens from Arizona and nearby regions are not as strongly curved as are those on material from the southeastern United States. The curve is, however, evident in living material. Even on the plants from the southeastern United States,



the curve of the sepals is most easily seen in living plants, although it usually may be detected on preserved material also.

I suspect that *I. hederacea* and the similar *I. nil* may not be separate species; instead they are most likely subspecies of the latter species. *Ipomoea hederacea* is the temperate form (growing at high altitudes within the tropics), and *I. nil* the tropical, regardless of their taxonomic rank. Further studies are required to resolve the situation.

*Ipomoea hederacea* was first found in Arizona in 1891 (*Toumey s.n.* ARIZ), in New Mexico in 1895 (*Mulford 1088 NY*), and in Texas in 1923 (Johnston 1959). This species was almost certainly introduced into the southwestern United States from the southeastern U.S. where it was originally endemic. Perhaps the species was introduced in cotton since it is a frequent weed in cotton fields (included by Parker 1972 as *I. hirsutula*, fig. 114).

*Representative specimens.* USA. Arizona: Cochise Co.: Sierra Vista, *McGill and Lehto 20454* (ASU); Coconino Co.: Sycamore Canyon Wilderness Area, *Pinkava et al. 5881* (ASU); Gila Co.: Kelvin, *Lehto and McGill 22364* (ASU); Graham Co.: Safford, *Bingham 1914* (ASU); Maricopa Co.: Tonto Forest Road 143, E Route 87, *Weber and Lehr 576* (DES); Pima Co.: Redington Rd, E of Tucson, *Austin and Austin 7596* (ASU); Pinal Co.: *Peebles 10255* (ARIZ); Santa Cruz Co.: Santa Rita Mts., *Thornber s.n.* (ARIZ); Yavapai Co.: Bloody Basin, Tangle Creek, *Blakeley 667* (DES); Yuma Co.: Cabeza Prieta Game Range at Montreal Well, *Munson s.n.*; Unknown County: S. Arizona, w/o locality, *Gentry s.n.* (ARIZ-273858). Texas: Jeff Davis Co.: lower Fern Canyon, *Warnock 809* (ARIZ). Mexico: Chihuahua: Sierra Madre Occidental, 82 mi W of Vieja Casas Grandes, *Tucker 2510* (ARIZ); Sonora: Alamas, Río Fuerte, *Gentry 2929* (ARIZ).

2. *IPOMOEA PURPUREA* (L.) Roth, Bot. Abh. 27. 1787.—*Convolvulus purpureus* L., Sp. Pl. ed. 2. 219. 1762. TYPE: Based on Dillenius, Hort. Elth. t. 84, fig. 97 (!lectotype by Verdcourt, 1957).

*Ipomoea hirsutula* Jacq. f., Eclog. Pl. Rariorum 1:65. t. 44. 1811.—

Type: No specimen located; the plate here chosen as lectotype. For additional synonyms see Austin (1986).

*Representative specimens.* USA. Arizona: Apache Co.: E of Ft. Apache, First Box Canyon, *Losper 16* (ASC); Cochise Co.: Chiricahua Mts., *Blumer 1892* (ARIZ); Gila Co.: Pinal Mts., Pioneer Pass Rec. Area, *Keil et al. 13329* (ASU); Graham Co.: US Hwy 70 at San Carlos River, *Pinkava et al. 15086* (ASU); Greenlee Co.: E Eagle Creek, 24 mi from Coronado Trail jct, *Gould and Robinson 5219* (ARIZ); Maricopa Co.: NE Phoenix, *Hubbs s.n.* (DES-26332); Navajo Co.: *Lehto 13951* (ASU); Pima Co.: Fresnal, Papago Indian Res., *Gouldman 107* (ARIZ); Santa Cruz Co.: Pena Blanca Lake,

*Lehto et al.* 17193 (ASU, DES); Yavapai Co.: Prescott, *Hurd* 2065 (ASC). New Mexico: Chaves Co.: Roswell, *Earle* 256 (TEX); Dona Ana Co.: Organ Mts., San Augustine Pass, *Worthington* 6635 (TEX); Grant Co.: Silver City, *Cole s.n.* (DES); Hidalgo Co.: road from Cloverdale to Douglas, *R. and M. Spellenberg* 3905 (ASU, NMC); Lincoln Co.: White Mts., *Wooton and Standley* 3631 (NMC); Luna Co.: Florida Mts., above Mahoney Park, *R. and M. Spellenberg* 6227 (NMC); Otero Co.: Sacramento Mts., Fresnal Canyon, *Ward and Soreng* 81-534 (NMC); San Miguel Co.: Pecos Canyon, Field Tract Camp Ground, *Austin and Austin* 7619 (ASU); Santa Fe Co.: Santa Fe, *Bartlett* 64 (NMC); Socorro Co.: Mogollon Mts., near "Grand Canyon" on e fork Gila, 19 Aug 1900. *Wooton s.n.* (NMC). Mexico: Chihuahua: Trompillo, Carretas, *White* 1112 (ARIZ); Sonora: Sierra Charuco, Río Mayo, *Gentry* 1709 (ARIZ).

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